

Claims 12, 20, 28, 29 and 37 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement for reciting a connection used for receiving an input. The Examiner contends that there are no specific “connections” mentioned in the specification for receiving “input signals.” Applicants respectfully disagree, and direct the Examiner’s attention to Paragraph 63 of the instant application which states that there is an “input” to the circuit model of the invention which represents certain signals. Furthermore, Paragraph 88 of the application recites “inputs” which are used to control certain elements shown in the circuit implementation of the invention illustrated in Figure 10. Additionally, Paragraph 93 of the application similarly recites that there is a voltage applied at either a first control input or a second control input. Moreover, it is stated that the inputs are used to “couple” the illustrated circuit to other circuits. Also, Paragraph 120 of the application refers to the “input” of the illustrated circuit implementation of Figure 15. Continuing, Paragraph 121 of the application recites “inputs [which] comprise sensory signals indicating the states of the actuation elements”. Thus, there is ample description in the specification of “inputs”. If the Examiner’s contention is that the word “connection” is not explicitly recited for describing how a signal is applied to an “input”, applicants respond that the term “connection” is so notoriously well known and universally understood. How else can a signal be applied to an “input” if it is not “connected” somehow? In fact, the present application, as discussed above, refers to coupling of inputs. It is respectfully submitted, that

Claims 19, 27 and 36 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement for reciting the clustering of circuits based on a higher degree of coupling, or a lower degree of coupling. These claims also stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite since, according to the Examiner, there is no way to ascertain what is a higher degree of coupling and what is a lower degree of coupling. The Examiner also states that there is no description in the specification which illustrates which two circuits result in higher or lower coupling. In response, applicants direct the Examiner's attention to Paragraph 189 which states that the coupling between units inside a cluster is stronger than between units at the boundary of clusters. Additionally, with respect to the indefiniteness issue, applicants point out that the coupling properties are relativistic in the sense that the coupling between units of a cluster as opposed to between units of different clusters is higher for the former as compared to the latter. Accordingly, applicants request that these rejections be withdrawn.

Claims 12, 20, 28, 29 and 37 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement, since they use the term “oscillation generation circuit”, which according to the Examiner there is “no mention of” in the application. In response, applicants direct the Examiner’s attention to Paragraphs 62 and 63 of the present application which disclose a quasi-sinusoidal signal generator (element 11, Figure 3). It is respectfully submitted that a sinusoidal or a quasi-sinusoidal signal is an oscillatory type of signal. This is a fundamental aspect of engineering and signal processing. The Examiner goes on to state that although this is mentioned in Paragraph 62, it is only mentioned in connection with an actual inferior olive neuron. However, Paragraph 62 refers to the “neuron model” of the present invention, not an actual neuron as suggested by the Examiner. Additionally, Paragraph 63 refers to the neuron model, as illustrated in the block diagram of Figure 3. Contrary to the Examiner’s contention, this description in the specification is not directed to “an actual inferior olive neuron” as stated in the Office Action. Accordingly, it is respectfully requested that this rejection be withdrawn.

Claims 13, 21, 30 and 38 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement, since they use the term “phase characteristic”, which the Examiner contends is not described in the specification in connection with the phase characteristic of an output of one circuit being maintained relative to a phase characteristic of an output of a second circuit. Additionally, these claims stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite since, according to the Examiner, “maintained relative” has no meaning and the specification is silent as to any meaning for this term. In response, applicants direct the Examiner’s attention to Paragraph 194 of the present application which discusses phase synchronization among units. Accordingly, applicants respectfully request that this rejection be withdrawn.

Claims 12, 20, 28, 29 and 37 stand rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement, since they use the term “characteristic information” in connection with the actuating elements, which according to the Examiner is not mentioned in the specification. In response, applicants direct the Examiner’s attention to Paragraph 121 of the present application which states that the “inputs . . . comprise sensory signals indicating the states of the actuation elements”. Thus, the specification here says “states of the actuation elements. The claims state “characteristic information of the actuating elements”. A “state” of an actuation element, is by definition a “characteristic” of the actuating element. Accordingly, applicants submit that the term “characteristic information of the actuating element” is adequately described and supported in the specification, and request that this rejection be withdrawn.

Claim 28 stands rejected under 35 U.S.C. § 112, first paragraph, for failing to comply with the written description requirement, since it uses the term “synchronize controlled” in connection with the movement of the actuation elements, which the Examiner contends is not mentioned in the specification. In response, applicants direct the Examiner’s attention to Paragraph 128 of the application which discusses how the present invention can control actuators to “actuate in a regular, alternating pattern”. Furthermore, paragraph 138 in discussing the olivo-cerebellar system which the present invention operates similar to, states that it provides the ability to work in

“synchrony”. Also, Paragraph 194 states that there is “synchronization among units”. Accordingly, applicants respectfully request that this rejection be withdrawn.

Claim Rejections – 35 U.S.C. § 103(a)

Claims 12-46 were previously rejected under 35 U.S.C. § 103(a) as being unpatentable over Maass, “Pulsed Neural Networks” (“Maass”) in view of Kawato, “A computational model for four regions of the cerebellum based on feedback error learning.” (“Kawato”). Applicants will respond to this rejection in light of the present amendments to the claims.

According to the Examiner, Maass teaches all the elements of previous claim 12, except for the oscillation output signal and the first and second spike signals, collectively forming a composite output signal which is capable of controlling an actuating element and wherein characteristic information of the actuating element is provided as part of the input signal to the control circuit.

Applicants respectfully submit that claim 12, as amended, is patentable over the cited references. Claim 12, and the other independent claims in this application, have been amended to better recite certain aspects of the present invention. Specifically, the independent claims have been amended to recite that the spike generation occurs when either of two threshold levels is crossed by the oscillatory signal. According to the present invention, when the oscillatory signal crosses a first (or high) threshold, a first spike signal is generated. Similarly, when the oscillatory signal crosses a second (or low) threshold, a second spike signal is generated. Thus, the composite output signal is the oscillatory signal along with first or second spike signals as they occur, i.e., when the oscillatory signal crosses the first or second thresholds, respectively. Moreover, the claims have been amended to indicate that the input signals to the circuit are used to adjust either the amplitude, phase or frequency of the oscillatory signal, and therefore affect when the oscillatory signal reaches either threshold, thus affecting the generation of either the first or second spike signals.

With respect to the cited Kawato reference (“A computational model for four regions of the cerebellum based on feedback error learning.”), applicants submit that this reference does not disclose an oscillator output signal. Rather, and with reference to Equation 2.1, and the corresponding description (p. 96), Kawato discloses a feedback error learning approach, where the feedback motor command, τ_c , is summed with an error correction signal or feedforward command, τ_n , to create the control signal for the controlled object. The feedforward command, τ_n , is in turn presented by Equation 2.1 and is indicated as being a function of the desired trajectory, Θ_d , and a coefficient/strength of coupling parameter, w . Thus, Kawato presents a somewhat iterative feedback/error correction type of control algorithm, which does not utilize oscillatory signals. In contrast, the present invention is directed to a control system and method which uses an oscillatory signal coupled with spike signals to control an actuating element. Characteristic information about the status of the actuating element is then used to adjust the amplitude, phase or frequency of the oscillatory output control signal. Kawato does not disclose such an oscillatory-type control system or method.

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Application No. 10/627,355
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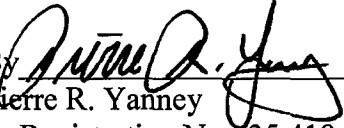
Docket No.: 05986/100K520-US1

Each and every point raised in the Office Action, dated August 13, 2007, has been addressed on the basis of the above amendments and remarks. In view of the foregoing it is believed that the pending claims, as amended, are in condition for allowance and it is respectfully requested that the pending claims be allowed and the case passed to issue.

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Respectfully submitted,

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